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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

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INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/ZA00/00120	6 July 2000	6 July 1999

TITLE OF INVENTION
HIGH TEMPERATURE METATHESIS PROCESS

APPLICANT(S) FOR DO/EO/US
Jan Mattheus Botha, Alta Spamer, Muzikayise Mthokozi Justice Mbatha, Bongani Simon Nkosi, Jan Petrus Karel Reynhardt, Kelvin Stephen Jacobus and Gavin Wyatt Schwikkard

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is attached hereto (required only if not communicated by the International Bureau).
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern other documents or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

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531 Rec'd PCT/PTO 28 DEC 2001

U.S. APPLICATION NO. (IF KNOWN) 10/037194	INTERNATIONAL APPLICATION NO. PCT/ZA00/00120	ATTORNEY'S DOCKET NUMBER 13777-002001

17. ☒ The following fees are submitted:

Basic National Fee (37 CFR 1.492(a)(1)- (5)):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... **$740**

International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... **$710**

International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)..... **$100**

	CALCULATIONS PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$890.00	
Surcharge of **$130** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$0.00	

Claims	Number Filed	Number Extra	Rate		
Total Claims	21 - 20 =	1	x **$18**	$18.00	
Independent Claims	2 - 3 =	0	x **$84**	$0.00	
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ **$280**	$0.00	
TOTAL OF ABOVE CALCULATIONS =				$1,008.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				$0.00	
SUBTOTAL =				$1,008.00	
Processing fee of **$130** for furnishing the English Translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f))				$0.00	
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Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$0.00	
TOTAL FEES ENCLOSED =				$1,008.00	
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a. ☒ A check in the amount of $1,008.00 to cover the above fees is enclosed.
b. ☐ Please charge my Deposit Account No. 06-1050 in the amount of $0.00 to cover the above fees. A duplicate copy of this sheet is enclosed.
c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-1050. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Y. Rocky Tsao
FISH & RICHARDSON P.C.
225 Franklin Street
Boston, Massachusetts 02110-2804
(617) 542-5070 *phone*
(617) 542-8906 *facsimile*

SIGNATURE

Jeffrey D. Hsi for Y. Rocky Tsao
NAME

40,024 34,053
REGISTRATION NUMBER

20365716.doc

Attorney's Docket No.: 13777-002001 / USP/F221/JL/sg

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Jan Mattheus Botha, et al.
Serial No. : Unassigned
Filed : Herewith
Title : HIGH TEMPERATURE METATHESIS PROCESS

BOX PCT
Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows:

In the claims:

Cancel claims 1-34.

Add claims 35-55.

35. (New) A metathesis process for the metathesis of Fischer-Tropsch olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting a Fischer-Tropsch olefin feedstock in the C_5 to C_{15} range to a metathesis catalyst at a temperature of from 300°C to 600°C and a pressure of from 1 to 30 Bar, said olefin feedstock including mono-methyl branched olefins.

36. The metathesis process as claimed in claim 35, wherein said process is carried out at a temperature of between 450°C and 550°C.

37. (New) The metathesis process as claimed in claim 35, wherein said metathesis catalyst is selected from a tungsten and molybdenum containing catalyst.

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Terry Jenkins
Typed or Printed Name of Person Signing Certificate

38. (New) The metathesis process as claimed in claim 37, wherein said process is metathesis catalyst is selected from a WO_3 and a MoO_3 catalyst.

39. (New) The metathesis process as claimed in claim 35, wherein said Fischer-Tropsch olefinic feedstock in the C_5 to C_{15} range includes at least linear alpha olefins and mono-methyl branched olefins.

40. (New) The metathesis process as claimed in claim 35, wherein said Fischer-Tropsch olefinic feedstock includes one or more olefins selected from the C_5 to C_9 range.

41. (New) The metathesis process as claimed in claim 35, wherein the product of the high temperature metathesis process is used in the production of alkyl benzene, plasticizers, detergents, and/or drilling fluids, having both a linear fraction and a branched fraction.

42. (New) The metathesis process as claimed in claim 41, wherein the branched fraction is mono-methyl branched and optionally includes di-methyl, and/or ethyl branching.

43. (New) A metathesis process for the metathesis of olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting an olefinic feedstock in the C_5 to C_{15} range to a metathesis catalyst at a temperature of from 300°C to 600°C and a pressure of from 1 to 30 Bar, the process including the recycling of a part of the product of the metathesis reaction to the reaction to increase the selectivity for a desired product range.

44. (New) A metathesis process as claimed in claim 43, wherein the olefinic feedstock is a Fischer-Tropsch olefinic feedstock including mono-methyl branched olefins.

45. (New) A metathesis process as claimed in claim 44, wherein the olefinic feedstock includes one or more olefins in the C_5 to C_9 range.

46. (New) A metathesis process as claimed in claim 43, wherein the process includes a separation stage wherein a recycle fraction in the C_5 to C_8 range is separated from the product and recycled to the reaction.

47. (New) A metathesis process as claimed in claim 43, wherein the quantity of recycle in the feedstock is selected to provide a C_9 and higher selectivity of above 50%.

48. (New) A metathesis process as claimed in claim 43, wherein the recycle makes up between 20% and 80% of the reaction feedstock.

49. (New) A metathesis process as claimed in claim 48, wherein the recycle makes up between about a third and three quarters of the reaction feedstock.

50. (New) A metathesis process product composition produced by a process as claimed in claim 44, wherein the ratio of linear to branched metathesis process products is greater than 1:1.

51. (New) A metathesis process product composition as claimed in claim 50, wherein the ratio of linear to branched metathesis process products is greater than 2:1.

52. (New) A metathesis process product composition as claimed in claim 50, wherein the ratio of linear to branched metathesis process products is about 3:1.

53. (New) A metathesis process product composition as claimed in claim 50, wherein the branching of the metathesis process products is predominantly mono-methyl branching.

54. (New) A metathesis process product composition as claimed in claim 50, wherein the branching of the metathesis process products includes di-methyl and/or ethyl branching.

55. (New) A metathesis process product composition as claimed in claim 50, which is used in the production of alkyl benzene, plasticizers, detergents, and/or drilling fluids, having both a linear fraction and a branched fraction with the ratio of linear to branched fractions being related to the ratio of linear to branched metathesis process product composition used in their production.

REMARKS

All amendments have been made to remove multiple dependency while conserving the claimed subject matter. No new matter has been introduced.

Attached is a marked-up version of the changes being made by the current amendment.

Claims 35-55 are now pending. Applicant submits that all of the claims are now in condition for examination, which action is requested. Please apply any charges or credits to Deposit Account No. 06-1050, referencing attorney docket no. 13777-002001.

Respectfully submitted,

Date: December 28, 2001

Jeffrey D. Hsi
Reg. No. 40,024

for Y. Rocky Tsao
Reg. No. 34,053

Fish & Richardson P.C.
225 Franklin Street
Boston, Massachusetts 02110-2804
Telephone: (617) 542-5070
Facsimile: (617) 542-8906

20365638 doc

Version with markings to show changes made

In the claims:

Claims 1-34 have been cancelled.

HIGH TEMPERATURE METATHESIS PROCESS

Field of the Invention

This invention relates to a high temperature metathesis process. In particular, the invention relates to the optimisation of the high temperature metathesis process to improve selectivity for a desired product range.

Background to the Invention

The applicant is aware that olefins in the C_9 to C_{14} range may be used as detergent and plasticizer precursors as well as for alkylation of benzene, and that C_{15} to C_{18} olefin ranges may be used as drilling fluids and drilling fluid precursors, amongst other uses.

Conventional thinking was that linear olefins may be used to produce linear alkyl benzene and linear oxo-alcohols which could be used to produce detergents and plasticizers which were believed to be both bio-degradable and suitable for their intended purpose. Thus, previously efforts were concentrated on producing linear oxo-alcohols and lineal alkyl benzene, and thus efforts were focused on linear olefins from which these could be made.

Recently, however, a new wave of thinking has lead to the belief that non-linear oxo-alcohols as well as non-linear alkyl chain alkyl benzene could be used alone or together with their linear counterparts for the production of

said detergents and plasticizers. In particular short chain branched olefins are believed best suited to produce such non-linear products. Thus, recent efforts have concentrated on the delinearization of the linear olefins in order to use such olefins in the production of the non-linear products.

Summary of the Invention

Surprisingly, after extensive research, the applicant has found that a peculiar olefin composition in the C_9 to C_{18} range, having both linear and non-linear olefins may be made by metathesis of Fischer-Tropsch olefins in the C_5 to C_{15} range.

Thus, according to a first aspect of the invention, there is provided a high temperature metathesis process for the metathesis of Fischer-Tropsch olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting a Fischer-Tropsch olefin feedstock in the C_5 to C_{15} range to metathesis reaction conditions, said olefin feedstock including mono-methyl branched olefins.

The high temperature metathesis process may be carried out at a temperature of between 300°C to 600°C.

Typically the high temperature metathesis process is carried out at a temperature of between 450°C and 550°C.

The operating pressure of the high temperature metathesis process may be between 1 and 30 bar, or even higher.

The high temperature metathesis process may use a tungsten or molybdenum based catalyst, for example, WO_3 or MoO_3, supported or unsupported, with or without co-catalysts. The support can typically be SiO_2, Al_2O_3, ZrO_2, TiO_2, or mixtures thereof.

The high temperature metathesis process Fischer-Tropsch olefinic feedstock in the C_5 to C_{15} range may include linear alpha olefins, mono-methyl branched olefins, paraffins, dienes, aromatics, and the like.

Typically, the Fischer-Tropsch olefinic feedstock includes one or more olefins selected from the C_5 to C_9 range.

The product of the high temperature metathesis process may include one or more mono-methyl branched olefins in the C_9 to C_{18} range.

The product of the high temperature metathesis process may include one or more linear olefins in the C_9 to C_{18} range.

The product of the high temperature metathesis process may include one or more mono-methyl branched olefins and one or more linear olefins in the C_9 to C_{18} range. The olefins of the product may be internal olefins.

The product of the high temperature metathesis process may be used in the production of alkyl benzene, plasticizers, detergents, drilling fluids, and the like, having both a linear fraction and a branched fraction (for alkyl benzene the alkyl chain is branched or linear).

Typically, the branched fraction will be mono-methyl branched. However, the branching may be di-methyl and/or ethyl.

According to a second aspect of the invention, there is provided a high temperature metathesis process for the metathesis of olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting an olefinic feedstock in the C_5 to C_{15} range to metathesis reaction conditions, the process including the recycling of a part of the product of the metathesis reaction to the reaction to increase the selectivity for a desired product range.

The olefinic feedstock may be a Fischer-Tropsch olefinic feedstock including mono-methyl branched olefins.

Typically, the olefinic feedstock includes one or more olefins in the C_5 to C_9 range.

Where the desired product range includes olefins in the C_9 to C_{18} range, the process includes a separation stage wherein a recycle fraction in the C_5 to C_8 range is separated from the product and recycled to the reaction.

The quantity of recycle in the feedstock may be selected to provide a C9 and higher selectivity of above 50%.

Generally, the quantity of recycle in the feedstock is selected to provide a C_9 and higher selectivity of above 50%.

Typically, the recycle makes up between 20% and 80% of the reaction feedstock.

Usually, the recycle makes up between about a third and three quarters of the reaction feedstock.

The total yield of high temperature metathesis process product in the C_9 to C_{18} range is above 40%.

Typically, the total yield of high temperature metathesis process product in the C_9 to C_{18} range is about 50%.

The total feedstock conversion of the high temperature metathesis process of the invention is typically in the range of 60% to 90%, usually about 80%.

The ratio of linear to branched high temperature metathesis process products is typically greater than 1:1.

Usually, the ratio of linear to branched high temperature metathesis process products is greater than 2:1.

Generally, the ratio of linear to branched high temperature metathesis process products is about 3:1.

The branching of the high temperature metathesis process products is predominantly mono-methyl branching, although some di-methyl, and/or ethyl branching may also be present.

The product of the high temperature metathesis process may be used in the production of alkyl benzene, plasticizers, detergents, drilling fluids, and the like, having both a linear fraction and a branched fraction (for alkyl benzene the alkyl chain is branched or linear), the ratio of linear to branched fractions being related to the ratio of linear to branched high temperature metathesis process products used in their production.

Description of the Drawing and Examples

The invention will now be described, by way of non-limiting illustration only, with reference to the accompanying line diagram.

In the diagram, reference numeral 10 generally indicates a high temperature metathesis process broadly in accordance with the invention.

The process 10 includes a reactor 12 operated at between 450°C and 550°C and at an operating pressure of between 1 and 30 bar. A Fischer-Tropsch olefinic feedstock 14 including mono-methyl branched olefins, is fed into the reactor 12. The feedstock 14 includes olefins in the C_5 to C_9 range.

Usually the feedstock 14 will be purified of oxygenates which may poison the catalyst by extractive distillation (not shown), prior to being fed to the reactor 12.

The reaction product 16 includes both linear and branched internal olefins in the C_2 to C_{18} range.

The reaction product 16 is fed to a separator 18 where it is cut into a light product stream 20 including C_2 to C_4, a recycle stream 22 including C_5 to C_8, and a heavy product 24 including product in the desired C_9 to C_{18} range.

The recycle stream 22 is combined with the feedstock 14 to form the total feedstock of the reactor 12.

The recycle stream 22 is between a third and three quarters of the feedstock 14.

The total yield of heavy product stream 24 is about 50%, while the feedstream 14 conversion is about 80%, with a selectivity for C_9 to C_{18} of about 60%.

The ratio of linear to branched product in heavy product stream 24 is about 3:1

Examples

Several runs were made by passing olefin containing feed downwards through a vertical pipe reactor, unless otherwise stated. This reactor (25.4 mm in diameter and 400 mm in length) was positioned in a temperature-controlled electric furnace with a thermocouple positioned in the catalyst bed to monitor reaction temperatures.

About 100 mm depth of glass beads (2 mm diameter) were placed at the bottom of the pipe reactor supported by a layer of quartz wool. Another layer of quartz wool was placed on top of the glass beads as support for the catalyst bed comprising of about 12 g of catalyst. This was topped with another layer of quartz wool and the remainder of the reactor filled with glass beads. The catalyst was activated by heating at 550°C in flowing air for 12 hours, followed by heating at 600°C for 2 hours under a flow of nitrogen and finally the catalyst was cooled under a flow of nitrogen to reaction temperature (typically 500°C).

Example 1

In this Example a catalyst in the form of a WO_3 supported on SiO_2 was used, in which the WO_3 and SiO_2 were in a mass ratio of 8:92. The process

was operated in the temperature range of 400 to 550°C and at a LHSV of 1 h^{-1}. As a feed was used a C_7 SLO narrow cut after NMP extraction, containing 3-methyl-1-hexene (0.7870%), 5-methyl-1-hexene (1.9068%), 4-methyl-1-hexene (3.1737%), 2-methyl-1-hexene (4.1847%), 2-methylhexane (1.6501%), 3-methylhexane (2.8000%), 1-heptene (74.5710%), n-heptane (6.3012%), 2-methyl-2-hexene (0.6832%), 3-heptene (0.3163%), 2-heptene (0.7038%) and dienes, cyclic olefins and aromatics (2.4386%) amongst others, based on mass% calculations. Results are set forth in the following table, Table 1:

Table 1

Temp °C	400	450	475	500	525	550
C_7 Conversion (%	4.4	20.4	50.0	65.9	71.9	78.4
Yield $C_9 - C_{14}$ (%)	2.4	8.9	20.3	23.9	20.2	13.9
Selectivity $C_9 - C_{14}$ (%)	55.6	43.9	40.6	36.3	28.1	17.7
Selectivity C_2	0.4	0.3	0.3	0.7	1.2	2.7
Selectivity C_3	5.0	2.6	2.7	4.6	7.7	14.0

Example 2

In this Example a catalyst in form of a WO_3 supported on SiO_2 was used, in which the WO_3 and SiO_2 were in a mass ratio of 8:92. The process was operated at 500°C and by recycling some of the olefins formed back to the reactor. As a feed was used a C_7 SLO narrow cut after NMP extraction, containing 3-methyl-1-hexene (0.7870%), 5-methyl-1-hexene (1.9068%), 4-methyl-1-hexene (3.1737%), 2-methyl-1-hexene (4.1847%), 2-methylhexane

(1.6501%), 3-methylhexane (2.8000%), 1-heptene (74.5710%), n-heptane (6.3012%), 2-methyl-2-hexene (0.3163%), 2-heptene (0.7038%) and dienes, cyclic olefins and aromatics (2.4386%) amongst others, based on mass% calculations. Results are set forth in the following table, Table 2:

Table 2

Run	Feed Conversion (%)	C_8 Yield (%)	$C_9 - C_{10}$ Yield (%)	$C_{11} - C_{14}$ Yield (%)	$C_{15} - C_{18}$ Yield (%)	$C_8 - C_{14}$ Yield (%)
1[a]	89.7	4.8	7.0	36.5	4.0	48.3
2[b]	96.4	2.1	22.1	33.5	5.5	57.7
3[c]	90.6	4.6	33.0	27.1	0.5	64.7
4[d]	90.1	11.8	31.3	22.8	0.2	65.9

(a) *1.0 LHSV based on fresh feed; 6.0 LHSV with recycle (1:5 recycle ration); (Recycle $C_5 - C_{10}$)*

(b) *1.4 LHSV based on fresh feed; 5.6 LHSV with recycle (1:3 recycle ratio); (Recycle $C_5 - C_9$)*

(c) *1.4 LHSV based on fresh feed; 5.6 LHSV with recycle 1:3 recycle ratio; (Recycle $C_{5/6} - C_8$)*

(d) *2.0 LHSV based on fresh feed; 5.0 LHSV with recycle 1:1.5 recycle ratio); Recycle $C_{4/5} - C_7$)*

Example 3

In this Example a catalyst in the form of a WO_3 supported on SiO_2 were in a mass ratio of 8:92. The process was operated at 500°C and at a LHSV of 3 h^{-1}. As a feed was used a C_5 SLO co-monomer grade cut containing 99% 1-pentene. The $C_5 - C_7$ fraction was recycled (1:1 recycle ratio) back to the

reactor in order to increase the yield towards the $C_8 - C_{14}$ fraction. Results are set forth in the following table, Table 3:

Table 3

Temp °C	**500**
C_5 Conversion (%	88.2
Yield $C_9 - C_{14}$ (%)	19.9
Selectivity $C_9 - C_{14}$ (%)	22.6
Selectivity C_2	5.2
Selectivity C_3	19.4

The applicant believes that it is an advantage of the invention as illustrated, that the high operating temperatures result in a high degree of resistance to poisoning of the metathesis catalyst by feedstock components, such as branched olefins, dienes, aromatics, and the like.

The applicant believes that it is a further advantage of the invention as illustrated that by recycling a cut of the product which is below the desirable carbon length range, high selectivity to desired products is achieved..

Claims:

1. A high temperature metathesis process for the metathesis of Fischer-Tropsch olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting a Fischer-Tropsch olefin feedstock in the C_5 to C_{15} range to metathesis reaction conditions, said olefin feedstock including mono-methyl branched olefins.

2. The high temperature metathesis process as claimed in claim 1, wherein said process is carried out at a temperature of between 300°C to 600°C.

3. The high temperature metathesis process as claimed in claim 1, wherein said process is carried out at a temperature of between 450°C and 550°C.

4. The high temperature metathesis process as claimed in any one of claims 1 to 3, wherein said process is carried out at a pressure of between 1 and 30 bar.

5. The high temperature metathesis process as claimed in any one of claims 1 to 4, wherein said process is carried out in the presence of a tungsten or molybdenum based catalyst.

6. The high temperature metathesis process as claimed in any one of claims 1 to 4, wherein said process is carried out in the presence of a WO_3 or MoO_3 catalyst.

7. The high temperature metathesis process as claimed in any one of the preceding claims, wherein said Fischer-Tropsch olefinic feedstock in the C_5 to C_{15} range includes at least linear alpha olefins and mono-methyl branched olefins.

8. The high temperature metathesis process as claimed in any one of the preceding claims, wherein said Fischer-Tropsch olefinic feedstock includes one or more olefins selected from the C_5 to C_9 range.

9. The high temperature metathesis process as claimed in any one of the preceding claims, wherein the product of the high temperature metathesis process includes one or more mono-methyl branched olefins in the C_9 to C_{18} range.

10. The high temperature metathesis process as claimed in any one of the preceding claims, wherein the product of the high temperature metathesis process includes one or more linear olefins in the C_9 to C_{18} range.

11. The high temperature metathesis process as claimed in any one of the preceding claims, wherein the olefins of the product are internal olefins.

12. The high temperature metathesis process as claimed in any one of the preceding claims, wherein the product of the high temperature metathesis process is used in the production of alkyl benzene, plasticizers, detergents, and/or drilling fluids, having both a linear fraction and a branched fraction.

13. The high temperature metathesis process as claimed in claim 12, wherein the branched fraction is mono-methyl branched.

14. The high temperature metathesis process as claimed in claim 13, wherein the branched fraction includes di-methyl, and/or ethyl branching.

15. A high temperature metathesis process for the metathesis of olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting an olefinic feedstock in the C_5 to C_{15} range to metathesis reaction conditions, the process including the recycling of a part of the product of the metathesis reaction to the reaction to increase the selectivity for a desired product range.

16. A high temperature metathesis process as claimed in claim 15, wherein the olefinic feedstock is a Fischer-Tropsch olefinic feedstock including mono-methyl branched olefins.

17. A high temperature metathesis process as claimed in claim 15 or claim 16, wherein the olefinic feedstock includes one or more olefins in the C_5 to C_9 range.

18. A high temperature metathesis process as claimed in claim 15, wherein the desired product range includes olefins in the C_9 to C_{18} range.

19. A high temperature metathesis process as claimed in claim 18 wherein the process includes a separation stage wherein a recycle fraction in the C_5 to C_8 range is separated from the product and recycled to the reaction.

20. A high temperature metathesis process as claimed in claim 19, wherein the quantity of recycle in the feedstock is selected to provide a C_9 and higher selectivity of above 50%.

21. A high temperature metathesis process as claimed in claim 19 or claim 20, wherein the recycle makes up between 20% and 80% of the reaction feedstock.

22. A high temperature metathesis process as claimed in claim 21, wherein the recycle makes up between about a third and three quarters of the reaction feedstock.

23. A high temperature metathesis process as claimed in any one of claim 18 to 22, wherein the total yield of high temperature metathesis process product in the C_9 to C_{18} range is above 40%.

24. A high temperature metathesis process as claimed in any one of claim 18 to 22, wherein the total yield of high temperature metathesis process product in the C_9 to C_{18} range is above 50%.

25. A high temperature metathesis process as claimed in any one of claims 15 to 24, wherein the total feedstock conversion is in the range of 60% to 90%.

26. A high temperature metathesis process as claimed in claim 25, wherein the total feedstock conversion is about 80%.

27. A high temperature metathesis process as claimed in any one of claims 15 to 26, wherein the ratio of linear to branched high temperature metathesis process products is greater than 1:1.

28. A high temperature metathesis process as claimed in any one of claims 15 to 27, wherein the ratio of linear to branched high temperature metathesis process products is greater than 2:1.

29. A high temperature metathesis process as claimed in any one of claims 15 to 28, wherein the ratio of linear to branched high temperature metathesis process products is about 3:1.

30. A high temperature metathesis process as claimed in any one of claims 15 to 29, wherein the branching of the high temperature metathesis process products is predominantly mono-methyl branching.

31. A high temperature metathesis process as claimed in any one of claims 15 to 30, wherein the branching of the high temperature metathesis process products includes some di-methyl and/or ethyl branching.

32. A high temperature metathesis process as claimed in any one of claims 15 to 31, wherein the products of the high temperature metathesis process are used in the production of alkyl benzene, plasticizers, detergents, and/or drilling fluids, having both a linear fraction and a branched fraction with the ratio of linear to branched fractions being related to the ratio of linear to branched high temperature metathesis process products used in their production.

33. A high temperature metathesis process substantially as herein described and illustrated.

34. A new high temperature metathesis process substantially as herein described.

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(71) Applicant *(for all designated States except US)*: **SASOL TECHNOLOGY (PTY) LTD** [ZA/ZA]; 1 Sturdee Avenue, Rosebank, 2196 Johannesburg (ZA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BOTHA, Jan, Mattheus** [ZA/ZA]; 38 Billingham Street, 9570 Sasolburg (ZA). **SPAMER, Alta** [ZA/ZA]; 60 Beefwood Street, SE3, 1911 Vanderbijlpark (ZA). **MBATHA, Muzikayise, Mthokozi, Justice** [ZA/ZA]; No. 3 Tswelopele Flat, 9571 Zamdela (ZA). **NKOSI, Bongani, Simon** [ZA/ZA]; 1 Waterkant Street, 9570 Sasolburg (ZA). **REYNHARDT, Jan, Petrus, Karel** [ZA/ZA]; 54 Arnot Street, Vaalpark, 9570 Sasolburg (ZA). **JACOBUS, Kelvin, Stephen** [ZA/ZA]; 8D Acacia, Fraser Street, 9570 Sasolburg (ZA). **SCHWIKKARD, Gavin, Wyatt** [ZA/ZA]; 20 Uitsig, Melt Bring Street, 9570 Sasolburg (ZA).

(74) Agent: **DUNLOP, Alan, J., S.**; Hahn & Hahn Inc., 222 Richard Street, Hatfield, 0083 Pretoria (ZA).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

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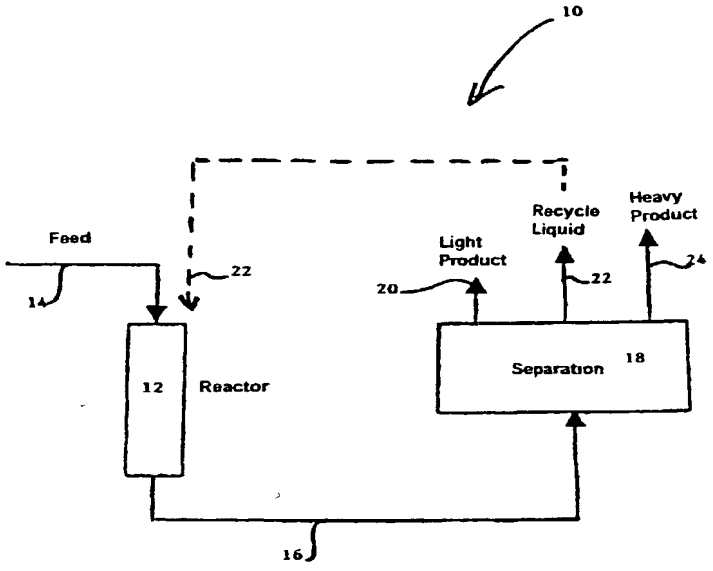
[Continued on next page]

(54) Title: HIGH TEMPERATURE METATHESIS PROCESS



(57) Abstract: The invention provides a high temperature metathesis process for the metathesis of Fischer-Tropsch olefins in the C_5 to C_{15} range, said metathesis process including the step of subjecting a Fischer-Tropsch olefin feedstock in the C_5 to C_{15} range to metathesis reaction conditions, said olefin feedstock including mono-methyl branched olefins. The invention also provides alkyl benzenes (AB's), drilling fluids and oxo-alcohols produced from the products of the metathesis process.

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Applicant(s): Jan Mattheus Botha, et al.
HIGH TEMPERATURE METATHESIS PROCESS

PCT/ZA00/00120

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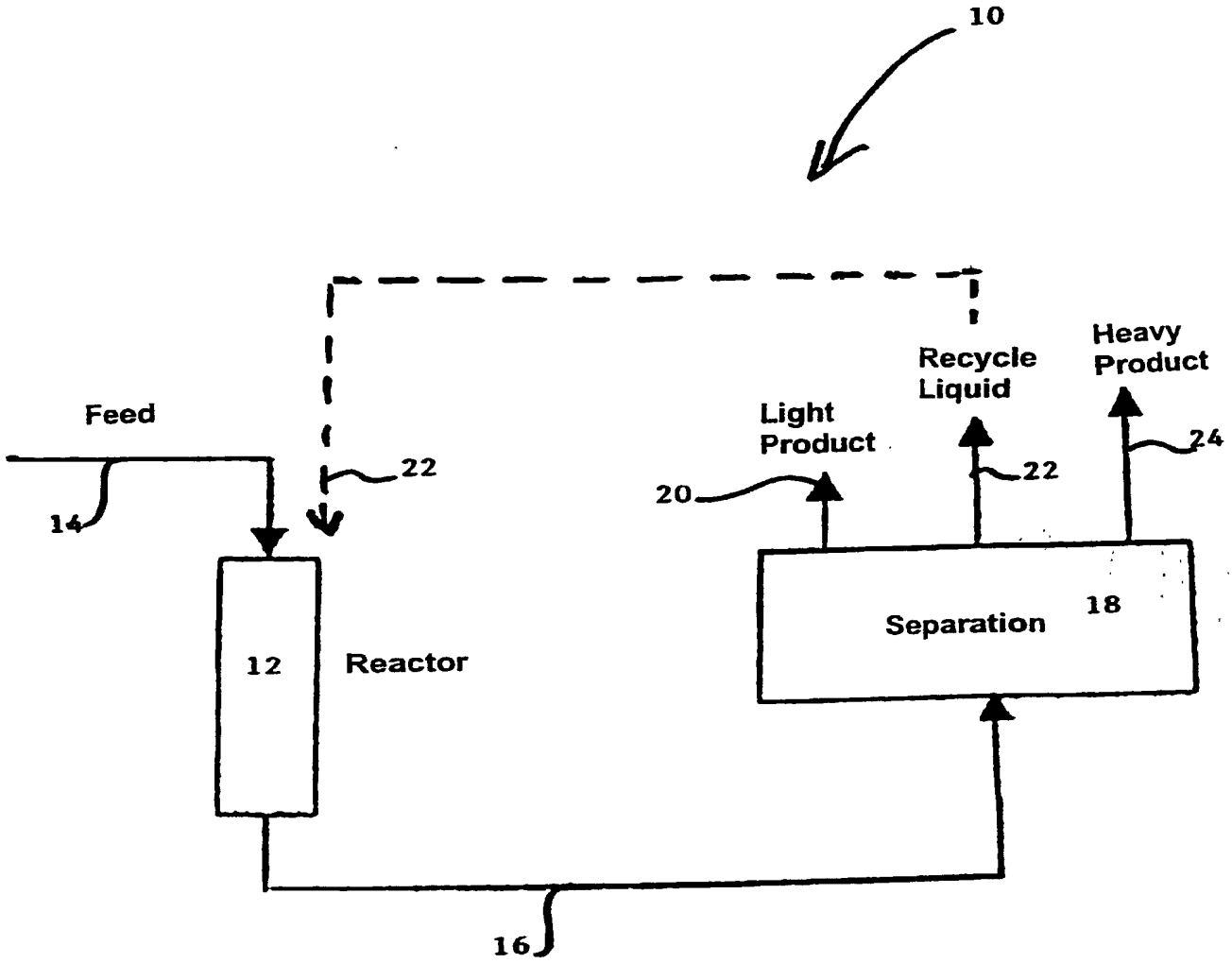

Attorney's Docket No.: 99999-night staff
Client's Ref. No.:

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled HIGH TEMPERATURE METATHESIS PROCESS, the specification of which:

[] is attached hereto.
[X] was filed on December 28, 2001 as Application Serial No. 10/019,471 and was amended on December 28, 2001.
[] was described and claimed in PCT International Application No. _____ filed on _____ and as amended under PCT Article 19 on _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information I know to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim the benefit under Title 35, United States Code, §119(e)(1) of any United States provisional application(s) listed below:

U.S. Serial No.	Filing Date	Status
60/142,382	July 6, 1999	Abandoned

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose all information I know to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Serial No.	Filing Date	Status

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

Country	Application No.	Filing Date	Priority Claimed
South Africa	ZA 99/4380	July 6, 1999	[X] Yes [] No
WIPO	PCT/ZA00/00120	July 6, 2000	[X] Yes [] No

I hereby appoint the following attorneys and/or agents to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Attorney's Docket No.: 99999-night staff
Client's Ref. No.:

Combined Declaration and Power of Attorney

Y. Rocky Tsao, Reg. No. 34,053
Eric L. Prahl, Reg. No. 32,590
Harold H. Fox, Reg. No. 41,498
Frank R. Occhiuti, Reg. No. 35,306
John F. Hayden, Reg. No. 37,640

Address all telephone calls to Y. ROCKY TSAO at telephone number (617) 542-5070.

Address all correspondence to Y. ROCKY TSAO at:

FISH & RICHARDSON P.C.
225 Franklin Street
Boston, MA 02110-2804

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

1.00

Full Name of Inventor: BOTHA, Jan Mattheus
Inventor's Signature: Jan Mattheus Botha Date: May 15, 2002
Residence Address: 38 Billingham Street, Sasolburg 9570, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa

2.00

Full Name of Inventor: SPAMER, Alta
Inventor's Signature: Alta Spamer Date: May 15, 2002.
Residence Address: 60 Beefwood Street, SE3 Vanderbijlpark 1911, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa

3.00

Full Name of Inventor: MBATHA, Muzikayise Mthokozisi Justice
Inventor's Signature: Muzikayise Mthokozisi Justice Mbatha Date: 9 May 2002.
Residence Address: 3 Tswelopele Flat, Zamdela 9571, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa

F221 US

Attorney's Docket No.: 99999-night staff
Client's Ref. No.:

Combined Declaration and Power of Attorney

4-W

Full Name of Inventor: NKOSI, Bongani Simon
Inventor's Signature: BONGANI SIMON NKOSI Date: April 23, 2002
Residence Address: 1 Waterkant Street, Sasolburg 9570, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa

5-W

Full Name of Inventor: REYNHARDT, Jan Petrus Karel
Inventor's Signature: Jan Petrus Karel Reynhardt Date: March 19, 2002
Residence Address: 54 Arnot Street, Vaalpark, Sasolburg 9570, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa

6-W

Full Name of Inventor: JACOBUS, Kelvin Stephen
Inventor's Signature: Kelvin Stephen Jacobs Date: May 15, 2002
Residence Address: 8D Acacia, Fraser Street, Sasolburg 9570, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa

7-W

Full Name of Inventor: SCHWIKKARD, Gavin Wyatt
Inventor's Signature: GW Schwikkard Date: May 15, 2002.
Residence Address: 20 Uitsig, Melt Bring Street, Sasolburg 9570, South Africa ZAX
Citizenship: South African
Post Office Address: PO Box 1, Sasolburg, 9570, South Africa